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10/702,136	11/05/2003	Naoki Hanashima	890050.447	6846
500	7590	07/29/2005	EXAMINER	
SEED INTELLECTUAL PROPERTY LAW GROUP PLLC 701 FIFTH AVE SUITE 6300 SEATTLE, WA 98104-7092			BLEVINS, JERRY M	
			ART UNIT	PAPER NUMBER
			2883	

DATE MAILED: 07/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/702,136	Applicant(s) HANASHIMA ET AL.	
	Examiner Jerry Martin Blevins	Art Unit 2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-10,12,13,20,21 and 23-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21 and 23-25 is/are allowed.
- 6) ☒ Claim(s) 1,3-10,12,13,20,26 and 27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>07/18/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Examiner accepts applicant's amendments to the specification. Prior objections are withdrawn.

Examiner accepts applicant's amendment to claims 20 and 21 pertaining to the prior objection due to informalities. Prior objection is withdrawn.

Applicant's amendment to claim 10 pertaining to the prior rejection under 35 U.S.C. 112, second paragraph, is accepted by examiner. Prior rejection under 35 U.S.C. 112, second paragraph, is withdrawn.

Claim Objections

Claims 10, 12, 13, and 27 are objected to because of the following informalities:

The phrase "each spot-size transformer" of claim 10 has no antecedent basis. Examiner interprets spot-size transformer to refer to the claimed embedded optical waveguide pairs.

Claims 12 and 13 are objected to based on their dependence on objected base claim 10.

Claim 27 claims a refractive index that is an ultraviolet curable resin. Examiner wishes to indicate that the refractive index is a numerical number, greater than or equal to 1.0, which is an intrinsic property of a material and is not the material itself. Examiner interprets this claim to mean that the refractive index of the material is that of an

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ultraviolet curable resin, or in other words, the material is, in fact, an ultraviolet curable resin.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-6, 9, 26, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent to Sasaki et al, number 2002182051, in view of US Patent to Alphonse et al, number 6,363,188 and US Patent to Broer et al, number 4,733,941.

Regarding Claim 1, Sasaki teaches an arrayed waveguide embedded optical circuit (Figure 1, element 1) comprising:

- a waveguide (elements 21-28);
- a groove (element 3) formed across the waveguide; and
- two or more (specifically 8) embedded optical waveguide pairs which function as spot-size transformers (elements 61-68 corresponding to elements 21-28) whose members face each other across the groove.

Sasaki teaches that the photodetectors (elements 61-68) corresponding to the optical waveguides (elements 21-28) function as spot-size transformers (paragraph 54, page

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6), while Figure 1 shows that elements 61-68 face the corresponding waveguide elements 21-28 from across the groove. Sasaki does not teach that each spot-size transformer comprises a first optical waveguide comprising a first core and a first cladding and a second optical waveguide comprising a second core as an extension of the first cladding and a second cladding. However, Alphonse teaches a spot-size transformer (Figure 1) which comprises a first optical waveguide (element 140) comprising a first core (element 110) and a first cladding (element 120) and a second optical waveguide (element 160) comprising a second core (element 120) as an extension of the first cladding and a second cladding (element 130). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the limitations of the spot-size converter of Alphonse in the waveguide-embedded optical circuit of Sasaki. The motivation would have been to widen the beam entering the gap region so as to reduce diffraction related loss. See lines 41-53 of Column 1 of Alphonse. Sasaki also does not teach that the second cladding is formed of a resin. However, Broer teaches an optical layer comprising a first cladding and a second cladding formed of a resin (column 1, lines 7-12). It would have been obvious to one of ordinary skill in the art at the time of the invention to form the second cladding of Sasaki in view of Alphonse of a resin, as taught by Broer. The motivation would have been to prevent mechanical damage (column 1, lines 15-17).

Regarding claim 3, Sasaki in view of Alphonse and Broer teaches the limitations of the base claim 1. Alphonse also teaches that the spot-size transformer further comprises a transition waveguide (element 150) positioned between the first optical

waveguide and the second optical waveguide that is constituted so that the width of the first core becomes gradually narrower as it goes toward the second optical waveguide (Figure 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the limitations of the spot-size converter of Alphonse in the waveguide-embedded optical circuit of Sasaki. The motivation would have been to widen the beam entering the gap region so as to reduce diffraction related loss. See lines 41-53 of Column 1 of Alphonse.

Regarding claim 4, Sasaki in view of Alphonse and Broer teaches the limitations of the base claim 3. Alphonse also teaches that the first cladding substantially covers the whole surface of the first core (Figure 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the limitations of the spot-size converter of Alphonse in the waveguide-embedded optical circuit of Sasaki. The motivation would have been to widen the beam entering the gap region so as to reduce diffraction related loss. See lines 41-53 of Column 1 of Alphonse.

Regarding claim 5, Sasaki in view of Alphonse and Broer teaches the limitations of the base claim 4. Alphonse also teaches that the center of the first core and the center of the second core are aligned substantially on the same axis (Figure 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the limitations of the spot-size converter of Alphonse in the waveguide-embedded optical circuit of Sasaki. The motivation would have been to widen the beam entering the gap region so as to reduce diffraction related loss. See lines 41-53 of Column 1 of Alphonse.

Regarding claim 6, Sasaki in view of Alphonse and Broer teaches the limitations of the base claim 5. Sasaki also teaches that the groove is formed at an angle (Figure 1, element 32) to a plane perpendicular to the axis of the light propagating through the spot-size transformer.

Regarding claim 9, Sasaki in view of Alphonse and Broer teaches the limitations of the base claim 6. Sasaki also teaches that an optical filter (element 4) is inserted in the groove.

Regarding claim 26, Sasaki in view of Alphonse and Broer teaches the limitations of the base claim 1. Alphonse also teaches that that the refractive index of the material of the second cladding is lower than that of the material of the second core (column 3, lines 18-29). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the limitations of the claddings and cores of Alphonse in the waveguide-embedded optical circuit of Sasaki. The motivation would have been to improve coupling of light from the first waveguide into the second waveguide (Alphonse, column 3, lines 18-29).

Regarding claim 27, Sasaki in view of Alphonse and Broer teaches the limitations of the base claim 1. Broer also teaches that the second cladding is an ultraviolet curable resin (column 5, lines 37-45). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the limitation of the second cladding of Broer in the waveguide-embedded optical circuit of Sasaki in view of Alphonse. The motivation would have been to improve the curing rate of the cladding (Broer, column 4, lines 15-33).

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki in view of Alphonse and Broer as applied to claims 1, 3-6, 26, and 27 above, and further in view of US Patent to Iwatsuka et al, number 6,130,778.

Regarding claims 7 and 8, Sasaki in view of Alphonse and Broer teaches limitations of the base claim 6. Sasaki also teaches a filter inserted in the groove at an angle to a plane perpendicular to the axis of the light propagating through the spot-size transformer (Sasaki, Figure 1 and Alphonse, Figure 1). Sasaki in view of Alphonse and Broer does not teach an optical isolator element. However, Iwatsuka teaches an optical isolator element (Figure 1) which could be inserted into a gap in a waveguide-embedded optical circuit. It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the filter of Sasaki in view of Alphonse with the optical isolator element of Iwatsuka. The motivation would have been to prevent reflection of light backwards across the gap.

Claims 10, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki in view of Alphonse, Broer, and Iwatsuka.

Regarding claim 10, Sasaki teaches an optical functional element (Figure 1, element 4) being inserted into a groove (element 3) of an arrayed waveguide-embedded optical circuit (element 1) which comprises a waveguide (elements 21-28), a groove (element 3) formed across the waveguide and two or more (specifically 8) embedded optical waveguide pairs which function as spot-size transformers (elements 61-68 corresponding to elements 21-28) whose members face each other across the groove, wherein the optical functional element comprises regions for passing the light

propagating through the two or more pairs of the embedded optical waveguides (Figure 1). Sasaki does not teach that each spot-size transformer comprises a first optical waveguide comprising a first core and a first cladding and a second optical waveguide comprising a second core as an extension of the first cladding and a second cladding. However, Alphonse teaches a spot-size transformer (Figure 1) which comprises a first optical waveguide (element 140) comprising a first core (element 110) and a first cladding (element 120) and a second optical waveguide (element 160) comprising a second core (element 120) as an extension of the first cladding and a second cladding (element 130). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the limitations of the spot-size converter of Alphonse in the waveguide-embedded optical circuit of Sasaki. The motivation would have been to widen the beam entering the gap region so as to reduce diffraction related loss. See lines 41-53 of Column 1 of Alphonse. Sasaki also does not teach that the second cladding is formed of a resin. However, Broer teaches an optical layer comprising a first cladding and a second cladding formed of a resin (column 1, lines 7-12). It would have been obvious to one of ordinary skill in the art at the time of the invention to form the second cladding of Sasaki in view of Alphonse of a resin, as taught by Broer. The motivation would have been to prevent mechanical damage (column 1, lines 15-17). Sasaki also does not teach a magneto-optic functional element or the various limitations involving birefringent plates. However, Iwatsuka teaches an optical functional element (Figure 1) comprising a magneto-optic functional element (element 5, specifically a Faraday rotator); first and second birefringent plates (elements 1 and 2) being located at

positions where, when the optical functional element is inserted in the groove of Sasaki, one half of the beam spot of light propagating through each pair of embedded optical waveguides of Sasaki is projected, and third and fourth birefringent plates (elements 3 and 4) located at positions where, when the optical functional element is inserted in the groove of Sasaki, the other half of the beam spot of light propagating through each pair of embedded optical waveguides of Sasaki is projected. (Compare Iwatsuka, Figure 1 with Figure 22 of applicant's drawings). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the magneto-optic functional element and birefringent plates taught by Iwatsuka in the optical functional element of Sasaki. The motivation would have been to improve efficiency of the passage of light across the gap between the pairs of optical waveguides.

Regarding Claim 12, Sasaki in view of Alphonse, Broer, and Iwatsuka teaches the limitations of the base claim 10. The magneto-optic functioning element of Iwatsuka also contains boundaries between the first and second birefringent plates and between the third and fourth birefringent plates that would coincide substantially with the direction of arrangement of the pairs of embedded optical waveguides if inserted into the groove of Sasaki. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the boundary of Iwatsuka in the optical functional element of Sasaki. The motivation would have been to improve efficiency of the passage of light across the gap between the pairs of optical waveguides.

Regarding claim 13, Sasaki in view of Alphonse, Broer, and Iwatsuka teaches the limitations of the base claim 10. Iwatsuka teaches an optical functional element (Figure

1) comprising a magneto-optic functional element (element 5), first and second birefringent plates (elements 1 and 2) arranged alternately on one surface of the magneto-optic functional element, and third and fourth birefringent plates (elements 3 and 4) arranged alternately on the other surface of the magneto-optic functional element. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the magneto-optic functional element taught by Iwatsuka in the teaching of Sasaki. The motivation would have been to allow efficient passage of light across the gap between the pairs of optical waveguides.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki in view of Iwatsuka.

Sasaki teaches an optical functional element (Figure 1, element 4) inserted into a groove (element 3) of an arrayed waveguide-embedded optical circuit (element 1) which comprises a waveguide (elements 21-28), a groove (element 3) formed across the waveguide and two or more (specifically 8) embedded optical waveguide pairs which function as spot-size transformers (elements 61-68 corresponding to elements 21-28) whose members face each other across the groove. Sasaki does not teach a magneto-optic functional element or the various limitations involving birefringent plates.

However, Iwatsuka teaches an optical functional element (Figure 1) comprising a magneto-optic functional element (element 5, specifically a Faraday rotator); first and second birefringent plates (elements 1 and 2) being located at positions where, when the optical functional element is inserted in the groove of Sasaki, one half of the beam spot of light propagating through each pair of embedded optical waveguides of Sasaki is

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projected, and third and fourth birefringent plates (elements 3 and 4) located at positions where, when the optical functional element is inserted in the groove of Sasaki, the other half of the beam spot of light propagating through each pair of embedded optical waveguides of Sasaki is projected. (Compare Iwatsuka, Figure 1 with Figure 22 of applicant's drawings). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the magneto-optic functional element and birefringent plates taught by Iwatsuka in the optical functional element of Sasaki. The motivation would have been to improve efficiency of the passage of light across the gap between the pairs of optical waveguides.

Allowable Subject Matter

Claims 21 and 23-25 are allowed.

Regarding claim 21, the prior art, as best exemplified by Iwatsuka, teaches an optical functional element (Figure 1) comprising a magneto-optic functional element (element 5, specifically a Faraday rotator); first birefringent plates (elements 1 or 3) formed on one side of a surface of the magneto-optic functional element intersecting a light path for passing light at predetermined intervals, and second birefringent plates (elements 2 or 4) formed on the same surface of the of the magneto-optic functional element at predetermined intervals. However, Iwatsuka does not teach that the first and second birefringent plates are on opposite sides of the same surface. (Compare Iwatsuka, Figure 1 with Figure 20 of applicant's drawings). Furthermore, Iwatsuka, either alone or in combination with the other prior art, neither discloses nor renders

obvious the teaching of first and second birefringent plates formed on opposites sides of the same surface of a magneto-optic functional element.

Regarding claim 23, the prior art, as best exemplified by Sasaki, teaches an optical functional element (Figure 1, element 4) inserted into a groove (element 3) of an arrayed waveguide-embedded optical circuit (element 1) which comprises a waveguide (elements 21-28), a groove (element 3) formed across the waveguide and two or more (specifically 8) embedded optical waveguide pairs which function as spot-size transformers (elements 61-68 corresponding to elements 21-28) whose members face each other across the groove, wherein the optical functional element comprises regions for passing the light propagating through the two or more pairs of the embedded optical waveguides (Figure 1). Sasaki does not teach a magneto-optic functional element or the various limitations involving birefringent plates. Iwatsuka teaches an optical functional element (Figure 1) comprising a magneto-optic functional element (element 5, specifically a Faraday rotator); first and second birefringent plates (elements 1 and 2) being arranged on one surface of the optical functional element and third and fourth birefringent plates (elements 3 and 4) being arranged on the other surface of the magneto-optic functional element. However, Iwatsuka does not teach that the birefringent plates are arranged in a checker pattern. Furthermore, Sasaki, either alone or in combination with the other prior art, does not disclose nor render obvious the teaching of the checker pattern arranged birefringent plates.

Regarding claim 24, the prior art, as best exemplified by Sasaki, teaches an optical functional element (Figure 1, element 4) inserted into a groove (element 3) of an

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arrayed waveguide-embedded optical circuit (element 1) which comprises a waveguide (elements 21-28), a groove (element 3) formed across the waveguide and two or more (specifically 8) embedded optical waveguide pairs which function as spot-size transformers (elements 61-68 corresponding to elements 21-28) whose members face each other across the groove. Sasaki does not teach a magneto-optic functional element or the various limitations involving birefringent plates. Iwatsuka teaches an optical functional element (Figure 1) comprising a magneto-optic functional element (element 5, specifically a Faraday rotator); first birefringent plates (elements 1 or 3) formed on one side of a surface of the magneto-optic functional element intersecting a light path for passing light at predetermined intervals, and second birefringent plates (elements 2 or 4) formed on the same surface of the of the magneto-optic functional element at predetermined intervals. However, Iwatsuka does not teach that the first and second birefringent plates are on opposite sides of the same surface. (Compare Iwatsuka, Figure 1 with Figure 20 of applicant's drawings). Furthermore, Sasaki, either alone or in combination with the other prior art, neither discloses nor renders obvious the teaching of first and second birefringent plates formed on opposites sides of the same surface of a magneto-optic functional element.

Claim 25 is allowed based on its dependence on allowed base claim 24.

Response to Arguments

Applicant's arguments with respect to claims 1, 3-10, 12, 13, and 20 have been considered but are moot in view of the new ground(s) of rejection.

Regarding applicant's arguments with respect to claims 1, 3-6, and 9, Sasaki in view of Alphonse teaches that the second core of the of the second optical waveguide is an extension of the first optical waveguide (see above rejection). Furthermore, Broer teaches the commonality and motivation of the new limitation that the second cladding is made of a resin (see above rejection).

Regarding applicant's arguments with respect to claims 7 and 8, Sasaki in view of Alphonse and further in view of Iwatsuka teaches that the second core of the of the second optical waveguide is an extension of the first optical waveguide (see above rejection). Furthermore, Broer teaches the commonality and motivation of the new limitation that the second cladding is made of a resin (see above rejection).

Regarding applicant's arguments with respect to claims 10, 12, and 13, Sasaki in view of Alphonse teaches that the second core of the of the second optical waveguide is an extension of the first optical waveguide (see above rejection). Moreover, Sasaki in view of Alphonse and further in view of Iwatsuka teaches an optical functional element having birefringent plates and being inserted into a groove of an arrayed waveguide-embedded optical circuit (see above rejection). Furthermore, Broer teaches the commonality and motivation of the new limitation that the second cladding is made of a resin (see above rejection).

Regarding applicant's arguments with respect to claim 20, Sasaki in view of Iwatsuka teaches an optical functional element inserted in a groove of an arrayed waveguide-embedded optical circuit (see above rejection). Furthermore, Sasaki in view

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of Iwatsuka teaches the relative locations of the birefringent plates as recited in claim 20 (see above rejection).

Applicant's arguments filed 07/08/2005, with respect to claim 21 have been fully considered and are persuasive. The rejection of the above claim has been withdrawn.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

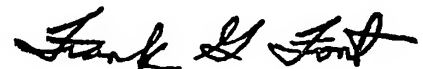
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerry Martin Blevins whose telephone number is 571-272-8581. The examiner can normally be reached on Monday through Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JMB



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